Should we have a co-ordinated and integrated database for terrestrial fauna survey data for Western Australia? Government researchers view

N L McKenzie & K D Morris

Science Division, Department of Conservation and Land Management
PO Box 51, Wanneroo WA 6065
email: normm@calm.wa.gov.au, keithm@calm.wa.gov.au

Introduction

In Western Australia (WA), a variety of private environmental consultants carry out fauna surveys for industry and government. Their focus is usually local, *e.g.* mine-site surveys. The State Government, through the Department of Conservation and Land Management (CALM) employs four full-time survey zoologists and four technical staff variously specialising in aquatic invertebrates, spiders, birds, reptiles and mammals. The government focus is on regional surveys that are often undertaken in collaboration with the Western Australian Museum, universities, CSIRO and consultants.

How is fauna data currently used in land-use planning?

Most land-use planning at regional and local scales have been based on 1:250 000 soft-geology, land-unit or vegetation maps in the hope that they provide adequate surrogates for patterns of biodiversity. Usually, these map-units are 'enhanced' with relevant fauna data held in museums, field guides or threatened species atlases. Typically, threatened fauna (and flora) atlases are based on 'presence-only' data, with a high proportion of records collected opportunistically next to roads. Their value in understanding the species distribution, habitat and status is impaired by the inherent sampling biases. If resources are available, specific fauna surveys are also commissioned. In WA, these local fauna surveys are probably the first substantial ecological reconnaissance within 200 km of the area. Most of the fauna records obtained during these surveys are treated as an end in themselves rather than as the first step towards developing an understanding of regional biodiversity.

Fauna data for land-use planning, but in the right form

A one-to-one relationship between species composition and physical attributes at sites provides data with an 'open architecture' and permits cost-efficient analyses. Open architecture is important because it allows different data sets to be combined, so that biodiversity models can be upgraded as new data are collected. Site-based data are amenable to interpolation procedures that predict the species composition at locations between the sampled sites, as we are unable to sample every point on a landscape.

To minimise their impact, land-use planning decisions need to be based on explicit biodiversity models that link "what" to "where". To build realistic models of patterns of biodiversity, we need to collect data for a variety of taxa because levels of cross-taxon congruence are generally low at both local and regional scales (Fig 1). The more taxa we sample, the more realistic our biodiversity models become.

Fauna data are expensive to collect, even at local scales, and it takes even more time to collect reliable site-species lists, which adds to delays. Even then, sub-optimum land-use decisions are inevitable unless the data can be interpreted in a regional context.

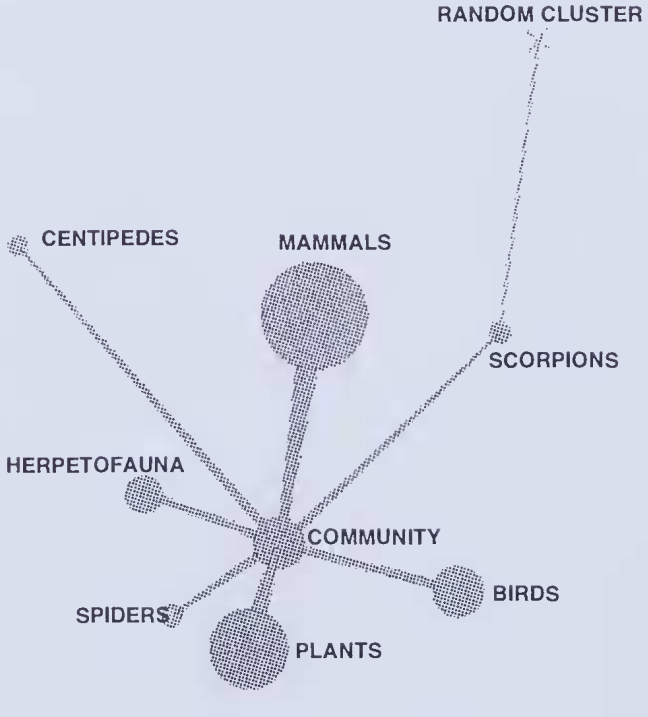

Figure 1. Three-dimensional scatter plot showing the low level of cross-taxon congruence among the seven biodiversity subsets sampled in the Carnarvon Basin, Western Australia (modified from McKenzie *et al.* 2000). 'Community' indicates the position of the combined data set. Standard error bars for the random cluster were calculated from 1000 matrices generated using a uniform random distribution. Minimum spanning tree linkages are shown. The radius of the biodiversity cluster was 80% of the distance from 'community' to the centre of the random cluster.

This paper was presented in similar form at the Workshop on the Co-ordination and Integration of Terrestrial Vertebrate Fauna Survey Database for Western Australia, held on April 5, 2002, at the University of Western Australia

Regional surveys

Problems of associated with costs and delay are exacerbated for regional surveys because they need sufficient resolution to represent biodiversity patterns accurately at this scale. Considering the size and diversity of WA, building this 'context' for even one of the State's 26 bioregions is an enormous task. Twelve person-years of effort goes into one of CALM's regional surveys; about 70% of this effort is on the faunal components.

Land-use decisions in most parts of WA will have to continue to be made using whatever fauna data are available, so we need to establish standardised protocols for future fauna surveys, and optimise access to existing data.

Standardising protocols for future surveys so that fauna data is effective

The challenge is to design fauna surveys so that they provide the maximum return of useful information for a particular input of resources and can add as much value as possible to existing knowledge. In the context of survey design, we recommend a publication by Margules & Austin (1991). As far as possible, future surveys should be site-based to retain the advantages of 'open architecture', sites should be exhaustively sampled, and surveys should cover a range of taxa with different physiologies and life-history strategies.

Future surveys should have a standard reporting format that includes detailed explanations of how the sample sites were stratified, the sampling methods that were used for each of the taxa, the sampling effort employed, the sampling periods/seasons, and a listing of specimens vouchered with the Western Australian Museum. Fauna survey designs should also include representative sampling based on environmental stratification, ensuring appropriate scale and number of replicates is used, ground-truthing data from desktop studies, and ensuring the dynamics in faunal composition (seasonal abundance) are addressed. Inevitably there will be a compromise between statistical sampling requirements and the practical logistical problems and costs.

Optimising access to existing data

Existing fauna data take a variety of formats, such as specimen-based natural history collections; unpublished reports in the files of private consultants, resource industries, government (Agriculture WA, CALM) and academics; government data-bases on threatened species (CALM, Environment Australia) and the published literature.

Stability and validity issues associated with any database can be difficult to manage. These include species identifications (failure to include the taxonomic authority), failure to update the database after a taxonomic change, recording presence-only data (absence data are seldom recorded) and failure to record sampling effort.

It is unlikely there will ever be a 'one-stop-shop'; you have to know who to ask, and the data may still need "interpretation" (reliability of identification, a cross-reference to locality data) before it can be appropriately used as records often lack an environmental context and their locality can be vague.

Conclusions

We need a single, co-ordinated and integrated data-base for fauna survey data that allows ecologists to quickly locate and list what is known. It needs to be layered, separating incompatible types of data (site-species data, land-unit lists, opportunistic records etc) so that it is useful to all. Given the incompatibility in the various types of data available, we need a filter as well as a custodian. We also need to review similar systems operating in other places such as Canada, Britain, and South Australia.

References

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